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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

LIEW, ALEX KOK SOON

ART UNIT

PAPER NUMBER

2624

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/689,721	Applicant(s) BAN ET AL.	
	Examiner ALEX LIEW	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 4/28/08.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1,9-14,17 and 18 is/are allowed.
- 6) ☒ Claim(s) 2-7,15,16 is/are rejected.
- 7) ☒ Claim(s) 8 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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1. The amendment filed on 4/28/08 is entered and made of record.
2. Response to Applicant's Arguments

On page 10 of the reply the applicant stated:

Ozeki asserts that the "slit line detecting circuit 22 is detecting a video signal exceeding the threshold value determined by a threshold value setting circuit 24 and delivering the detected video signal as a slit line." Thus, the slit line detecting circuit 22 does not "receives a reflected light of a light projected by projecting unit onto said object by unit of light receiving unit to acquire three-dimensional information on an inclination of a surface on which said measuring point of said object exists and/or a distance from said camera to the surface" as recited in claim 2.

The examiner agrees; an updated search shows Callari (US pat no 6,415,051) discloses receiving a reflected light of a light projected by projecting unit onto said object by unit of light receiving unit to acquire three-dimensional information on an inclination of a surface on which said measuring point of said object exists and/or a distance from said camera to the surface (figures 2 and 3). One skilled in the art would include obtaining inclination information on an object to reveal hidden curvature on an object to further improve 3-D model generation. The applicant further stated:

Applicants respectfully argue again that, claim 2 actually recites that "said information combining unit combines information acquired by said two-dimensional information acquiring unit and information acquired by said three-dimensional information acquiring unit based on calibration information of said *camera* and generates new three-dimensional information"

Callari discloses calibrating the structure light source (column 4, lines 6-11) and imaging device (column 5, lines 35-39) and using the calibration information to create 3D model of object (column 2, lines 21-27). One skilled in the art would include calibrating imaging device because internally correct the camera parameters to avoid moving the camera position and orientation, to save power.

3. Allowable claims

Claims 1, 9-14, 17 and 18 are allowable.

With regards to claim 1, the examiner cannot find any applicable prior art and/or motivation/suggestion disclosing a camera that captures images of the object, including a first image when the projecting unit does not project the slit light of the spot light onto the surface of the object, and a second image when the projecting unit projects the slit or the spot light onto the surface of the object in combination with the rest of the limitations of claim 1.

With regards to claim 9, the examiner cannot find any motivation or suggestion disclosing a unit for determining a straight line in a three-dimensional space which passes through the measuring point on said object and a specific point on said camera, a unit for determining, from the information on said first surface, information on a virtual second surface which has a certain positional relationship with said first surface and passes through the measuring point on said object, and a unit for determining an intersection between said straight line and said second surface in combination with the rest of the limitations of claim 9.

Claim Objections

Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With regards to claim 8, the examiner cannot find any motivation or suggestion disclosing means for determining, in the three-dimensional space, a straight line which passes through the measuring point on said object and a specific point on said camera and means for determining, based on information on said straight line and the surface on which the measuring point on said object exists, an intersection between said surface and said straight line in combination with the rest of the limitations of claim 2.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 2 – 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozeki (US pat no 5,280,542) in view of Okajima (US pat no 5,917,940) and Callari (US pat no 6,415,051).

With regards to claim 2, Ozeki discloses a three-dimensional visual sensor which performs a three-dimensional measurement of an object, comprising:

a two-dimensional information acquiring unit, wherein said two dimensional information acquiring unit determines a position of a measuring point of said object on a two-dimensional image including said object captured by a camera (see figure 1, element 14 is the two dimensional acquiring unit, see column 3, lines 37 to 43 where it discusses determining the position of the slit light in the image);

a three-dimensional information acquiring unit receives a reflected light of a light projected by projecting unit (see figure 1, element 22 detects slit light, see figure 8 where it shows a graph of the intensity of the slit light, where the intensities varies showing up); and

an information combining unit, wherein said information combining unit combines information acquired by said two-dimensional information acquiring unit and information acquired by said three dimensional unit of said camera and generates new three-dimensional information (see figure 1, the slit line detecting area, detecting the surface shape of the object is read as the three-dimensional information and the image taken by the 'TV camera' is read as the two dimensional image, 38, the vertical imaging position detecting circuit detects the two-dimensional image in the vertical direction with its output going to the lookup table, the lookup table is the final determined position of object of the image, the information from the slit line detecting unit are processed through elements 30, 32 and 38' then is inputted to the lookup table, Ks is read as the

three dimensional information combined with Ls, where it is read as the two-dimensional information).

Ozeki does not disclose comparing a reference image including a characteristic area of the object with an image of said characteristic area in said two-dimensional image and determines parameter values that describe a transformation expressing geometrical deformation with respect to said reference image provided by mapping using said camera. Okajima discloses comparing a reference image including a characteristic area of the object with an image of said characteristic area in said two-dimensional image and determines parameter values that describe a transformation expressing geometrical deformation with respect to said reference image provided by mapping using said camera (see figure 6, the deformation is calculated at 34, the pattern of the object is discriminated at 40 using reference image data as template). One skilled in the art would include calculating a deformation value because to include another information about the object to improve recognition of the object.

Ozeki and Okajima do not discuss receiving a reflected light of a light projected by projecting unit onto said object by unit of light receiving unit to acquire three-dimensional information on an inclination of a surface on which said measuring point of said object exists and/or a distance from said camera to the surface and calibrating the video prior imaging the object.

Callari discloses receiving a reflected light of a light projected by projecting unit onto said object by unit of light receiving unit to acquire three-dimensional information on an inclination of a surface on which said measuring point of said object exists and/or a

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distance from said camera to the surface (figures 2 and 3). One skilled in the art would include obtaining inclination information on an object to reveal hidden curvature on an object to further improve 3-D model generation. Callari also discloses calibrating the structure light source (column 4, lines 6-11) and imaging device (column 5, lines 35-39) and using the calibration information to create 3D model of object (column 2, lines 21-27). One skilled in the art would include calibrating imaging device because internally correct the camera parameters to avoid moving the camera position and orientation, to save power.

With regards to claim 3, Ozeki discloses reflected light is received at a position of the slit light receiving unit which is the same as a position of the camera at which said two-dimensional image is captured (see figure 1, the slit line detecting unit receives it information from the TV camera, which implies the position of the slit light in the image is the same as the position of camera).

With regards to claim 4, Ozeki discloses camera serves as said light receiving unit (see citation of claim 3).

3. Claims 5 – 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozeki ('542) in view of Okajima ('940) and Callari ('051) as applied to claim 4 further in view of Tsujino (US pat no 5,307,419).

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With regards to claim 5, Ozeki, Okajima and Callari disclose all the limitations of claim 4; Ozeki discloses combining two dimensional information with three dimensional information (see figure 1, lookup table) and Okajima discloses calculating deformation parameter (see figure 6, 34), but both references do not disclose *mounting* camera on a robot and captures two and three dimensional information. Tsujino discloses a camera being mounted on a robot and captures two dimensional images (column 1, lines 16 to 30, the camera is mounted on the autonomous moving body). One skilled in the art would include mounting a camera on a robot because operator is able to program positional information, knowing where to go next, into the robot, so the operator does not have to manually operate it.

With regards to claim 6, Tsujino discloses obtaining positional information from said robot (see column 4, lines 1 to 4).

With regards to claim 7, Ozeki discloses obtaining three-dimensional means (see figure 1, and new three dimensional data are obtained because element 14 of figure is a TV camera which captures images continuously).

4. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozeki ('542) in view of Okajima ('940) and Callari ('051) as applied to claim 2 further in view of Kinoshita (US pat no 6,137,902).

With regards to claim 15, Ozeki and Okajima disclose all of the claim elements / features as discussed above in rejection for claim 2 and incorporated herein by reference, but fails to disclose using Affine transform. Kinoshita discloses a visual sensor according to claim 2, wherein said transformation is an affine transformation (figure 5). One skill in the art would use Affine transform because affine transforms provides linear relation, improving three-dimensional information estimation (Kinoshita column 1 lines 35-40) such as the orientation and position of the camera.

With regards to claim 16, see the rationale and rejection for claim 15. In addition, affine transform obtain perspective model of the camera.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX LIEW whose telephone number is (571)272-8623 or cell (917)763-1192. The examiner can be reached anytime.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew C Bella/
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7/30/08